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**MEMORANDUM**

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**TO:** SHELLEY POTICHA, CENTER FOR TOD; VALERIE KNEPPER AND JAMES CORLESS, MTC

**FROM:** TIMOTHY ROOD AND ERIC YURKOVICH, CALTHORPE ASSOCIATES

**SUBJECT:** MTC RESOLUTION 3434 TOD POLICY EVALUATION AND RECOMMENDATIONS TASKS 6B, 6C, & 6E

**DATE:** MAY 26, 2005

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This memorandum summarizes the evaluation methodology, results, and recommendations for the proposed Metropolitan Transportation Commission Transit-Oriented Development Policy case studies. As outlined in previous memos, the case studies were used to test and refine the proposed MTC Transit-Oriented Development Policy. The case study process involved the analysis of current and anticipated growth in the four case study corridors (Dumbarton, eBART, SMART, and BART to San Jose). Three case study stations (Union City Dumbarton/BART station, Downtown Petaluma SMART station, the Richmond ferry terminal) were analyzed to explore the potential of TOD in greater detail.

**Performance Evaluation**

The Transit-Oriented Development Policy Thresholds are a key component of the case study effort. We evaluated each of the four case study corridors potential to achieve the thresholds by calculating the existing and anticipated levels of population and employment in these corridors. Initially, we evaluated two performance measures for each corridor:

- population per square mile
- population and employment per square mile

The initial proposals for the thresholds were set by MTC based on available information about existing and projected future development in various corridors in the region. The proposed thresholds vary by mode and are expressed as ranges.

<b>Resolution 3434 Expansion Corridor Transit Mode</b>	<b>MTC Population per Square Mile Threshold</b>	<b>MTC Population and Employment per Square Mile Threshold</b>
Commuter Rail	6,000 – 16,000	15,000 – 25,000
BART	11,000 – 21,000	25,000 – 45,000

For the case study corridors, we evaluated four sources of population and employment figures:

- Census 2000
- ABAG Projections 2003 (anticipated 2030 horizon)
- Generalized Planned Land Use capacity estimates (via ABAG)
- Center for Transit-Oriented Development estimates of TOD potential

### *Census 2000 and Projections 2003*

The Association of Bay Area Governments gathered existing population, employment, and household information for Census 2000 and future Projections 2003. Data were gathered using the Transit Planning Area geography. The Transit Planning Areas are an aggregation of Census blocks within approximately one-half mile of a station location created during the Smart Growth Strategy Regional Livability Footprint Project. These figures were compared to the proposed MTC performance measures.

*Figure 1: Comparison of Census 2000 and Projections 2003 to Proposed MTC Corridor Population per Square Mile Thresholds.*

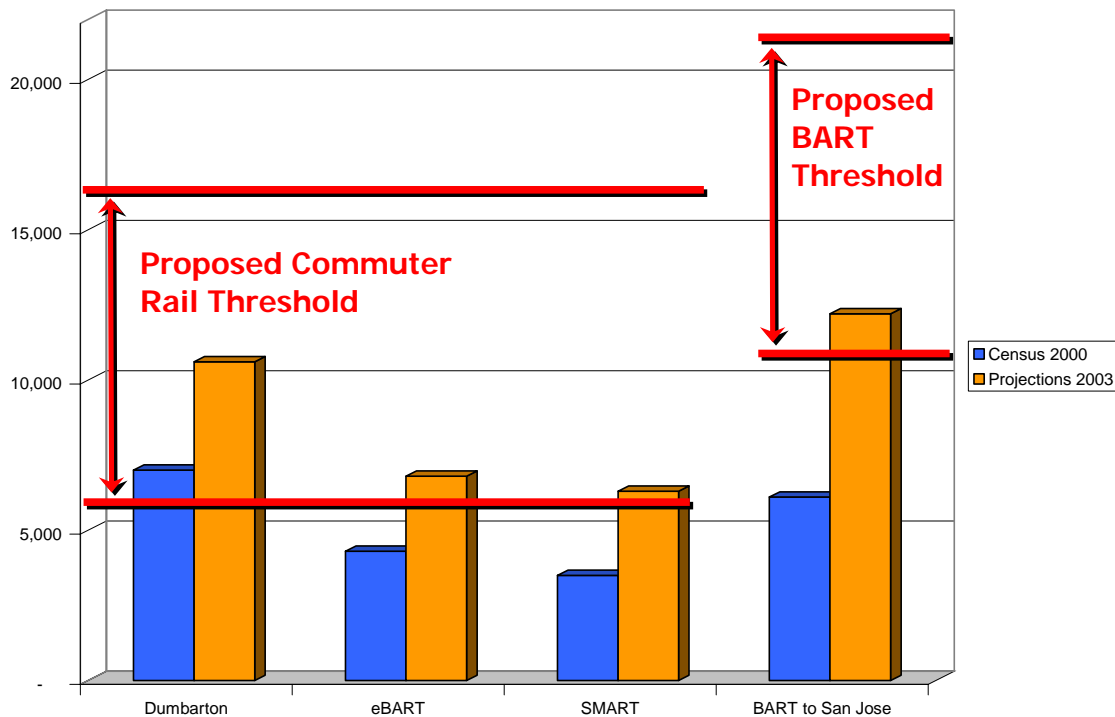
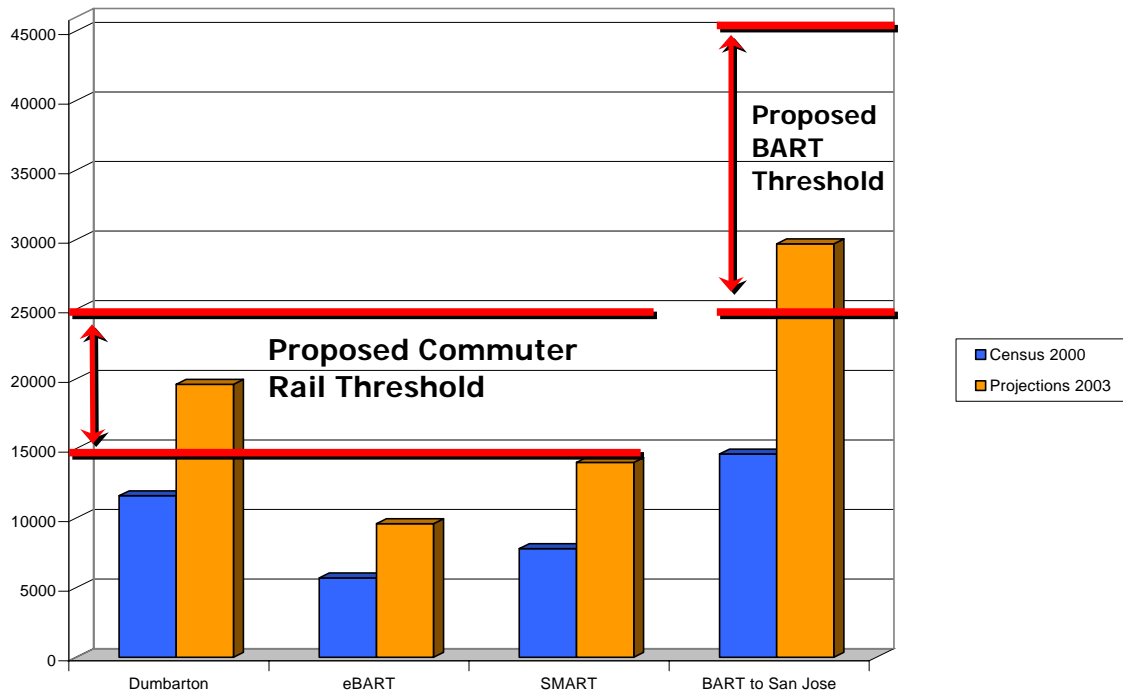


Figure 1 shows population per square mile and Figure 2 (below) shows population and employment per square mile. Population per square mile was evaluated at the corridor level by summarizing the total population and land area for all Transit Planning Areas in the corridor. Total corridor population was divided by total land area, yielding population per square mile. To derive the population and employment measure, we added all

population and employment together and then divided the figure by the total land area of the Transit Planning Areas. This analysis was completed for each case study corridor.

*Figure 2: Comparison of Census 2000 and Projections 2003 to Proposed MTC Corridor Population and Employment per Square Mile Thresholds.*



#### *Generalized Planned Land Use Estimate*

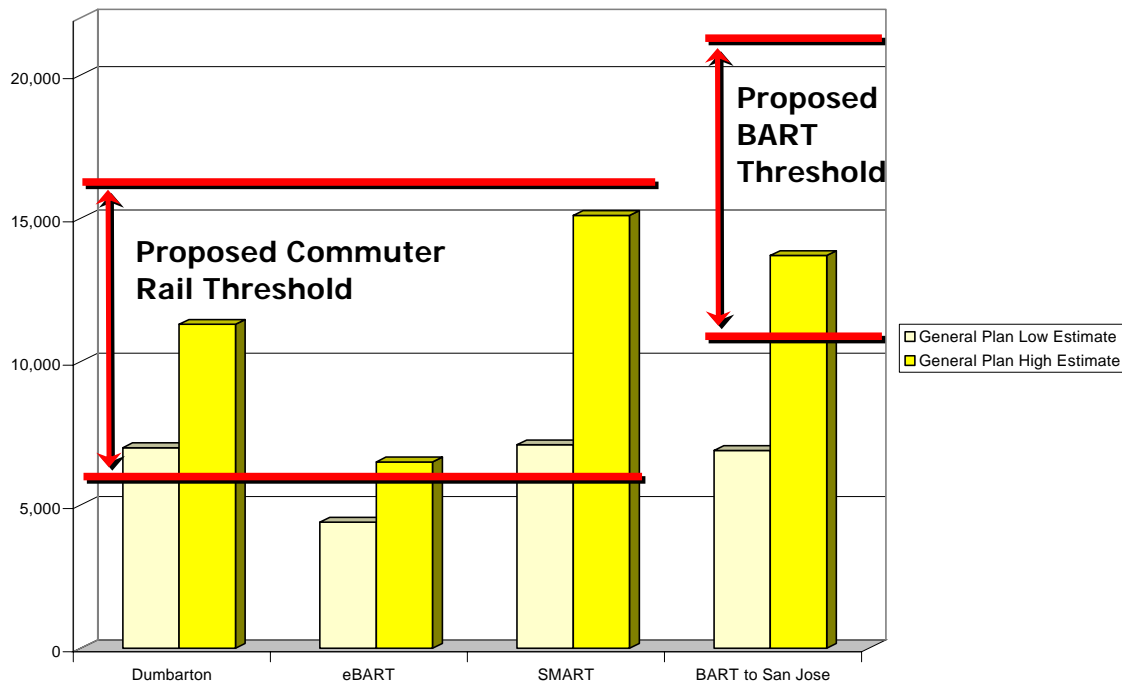
In addition to estimates of existing Census 2000 and future Projections 2003 data, we prepared a third set of population and employment figures consisting of estimated buildout capacities of local general plans. ABAG compiled local jurisdictions land use designations into a simplified land use coverage. The Generalized Planned Land Use coverage includes 13 land use designations for the initial set of Transit Planning Areas. Several changes to the station locations after the initial data processing were not accounted for along the SMART and Dumbarton corridors.

For the population estimate, we used a straightforward methodology. We calculated a low and high housing unit buildout capacity range for each Transit Planning Area based on the local general plan designations. It should be noted that the density ranges reflect the categories provided in the local jurisdiction's general plan. The following table is an example of the methodology.

<b>Transit Planning Area Generalized Planned Land Use Example</b>				
General Plan Classification	Acres	Density Range (Units per Acre)	Low Density Units Buildout Estimate	High Density Units Buildout Estimate
High Density Residential	10	20-40	200	400
Medium Density Residential	20	10-20	200	400
Low Density Residential	40	1-10	40	400
Mixed Use	5	12-24	60	120
<b>Transit Planning Area Total</b>	<b>75</b>	<b>N/A</b>	<b>500</b>	<b>1,320</b>

Next, we subtracted Census 2000 *household* figures from the low and high density buildout estimates, yielding an estimated new household increment. New units were assigned a household size of 2.5 people, and the resulting incremental population figure was added to the Census 2000 *population* figure. This yields a total buildout population estimate for each transit planning area. Both total population buildout and land area (in square miles) were summed for each corridor's transit planning areas. Dividing the corridor's total population buildout by the corridor's total land area in square miles generated population per square mile for each case study corridor.

*Figure 3: Comparison of the Generalized Planned Land Use to Proposed MTC Corridor Population per Square Mile Thresholds.*

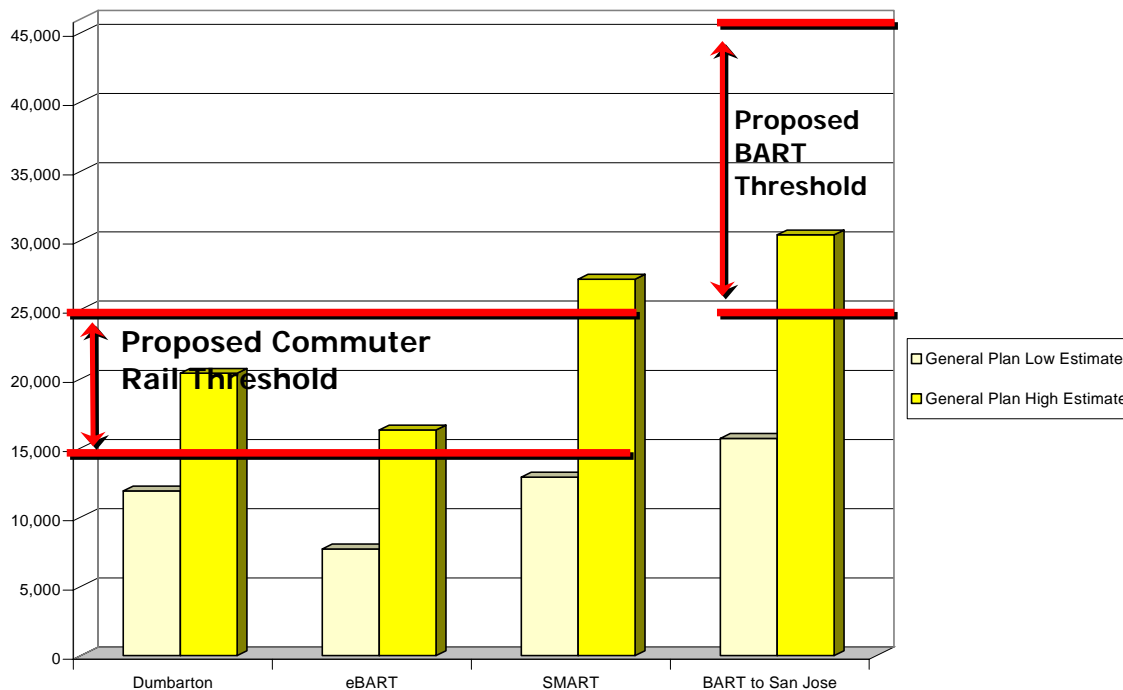


The methodology used to determine employment capacity is not as straightforward. We translated acres of Generalized Planned Land Use into an estimate of employment capacity using a constant set of assumptions. The ABAG Generalized Planned Land Use aggregated employment into four types: high-intensity commercial, low-intensity commercial, industrial, and mixed use.

For each of the four types of employment, we assumed a low and high density average floor area ratio (FAR), a low and high density proportion of commercial types, and a low and high density commercial square feet per employee average. We developed these assumptions using typical development densities in the Bay Area.

These employment designations and assumptions were used to calculate both a low and high employment buildout capacity for each Transit Planning Area. These low and high employment estimates were added to the range of Generalized Planned Land Use population estimates for each case study corridor. Population and employment totals were divided by the total land area, yielding a per square mile figure.

*Figure 4: Comparison of the Generalized Planned Land Use to Proposed MTC Corridor Population and Employment per Square Mile Thresholds.*



#### *Center for Transit-Oriented Development Estimates*

The fourth set of population and employment figures was developed by the consultant team. The Center for Transit-Oriented Development (CTOD) estimates approximate the potential for future development by balancing both land supply and estimated TOD demand for each station in the case study corridors. Further, we evaluated each station's unique role based on its regional location, surrounding development, commute patterns, and intermodal connections.

In developing the CTOD scenario, we attempted to accommodate the estimated potential demand for both employment and housing near transit in each corridor based on the "Transit-Oriented Development Demand Analysis" completed by Strategic Economics and the Center for TOD. We also attempted to accommodate the mix of uses anticipated in station area and specific plans. Thus, the CTOD estimates are an attempt to show a market-feasible scenario for accommodating the potential demand for TOD in each corridor while also achieving local economic development goals.

#### *Land Supply Estimates*

Using recent aerial photographs (2002 & 2004), we estimated the station area land supply - the amount of vacant land, agricultural land, and land with potential for infill development in the *half-mile radius*. These land supply estimates are conservative since they assume redevelopment occurs only on surface parking lots. Then we applied a density of future development using the typology of TOD "place types" identified by the Center for TOD, based on characteristics including land use mix, regional connectivity, and frequency of transit service.

Further assumptions were made for each station area regarding the proportion of residential and commercial uses and proportion of underutilized land that would develop. These assumptions were based on local plans, when available, including station area and specific plans.

The estimated new population and employment from TOD were added to Census 2000 figures for the Transit Planning Areas and normalized by total land area in the corridor.

Figure 5: Comparison of the CTOD Estimate to the Proposed MTC Corridor Population per Square Mile Thresholds.

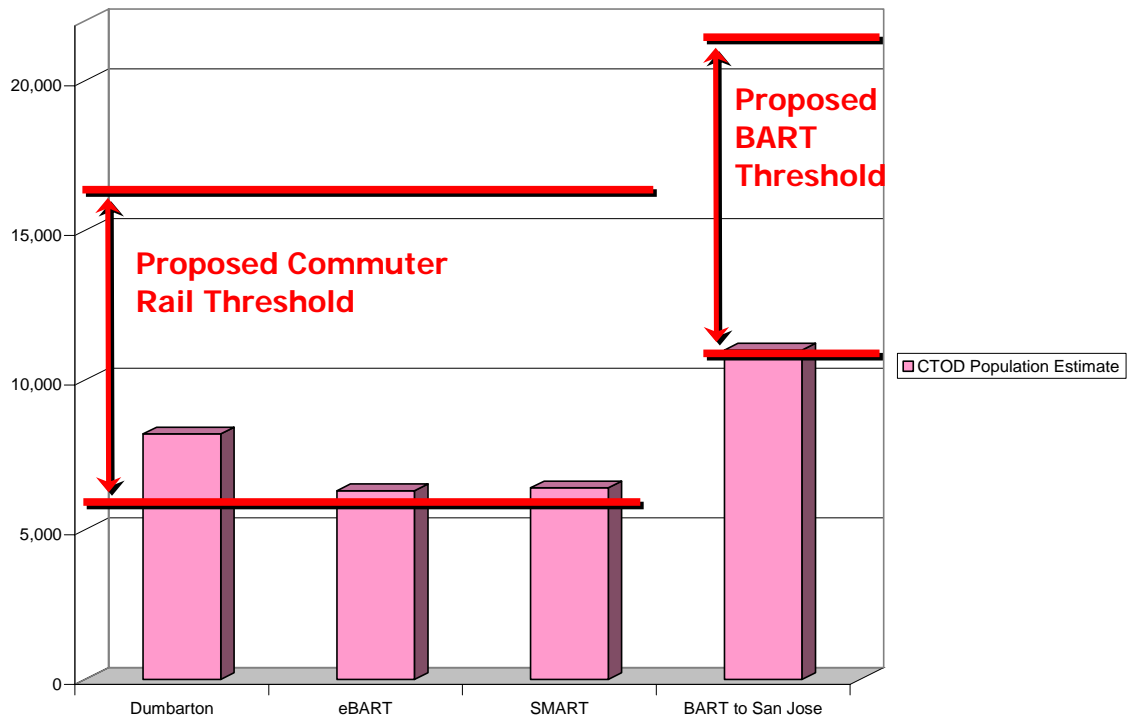
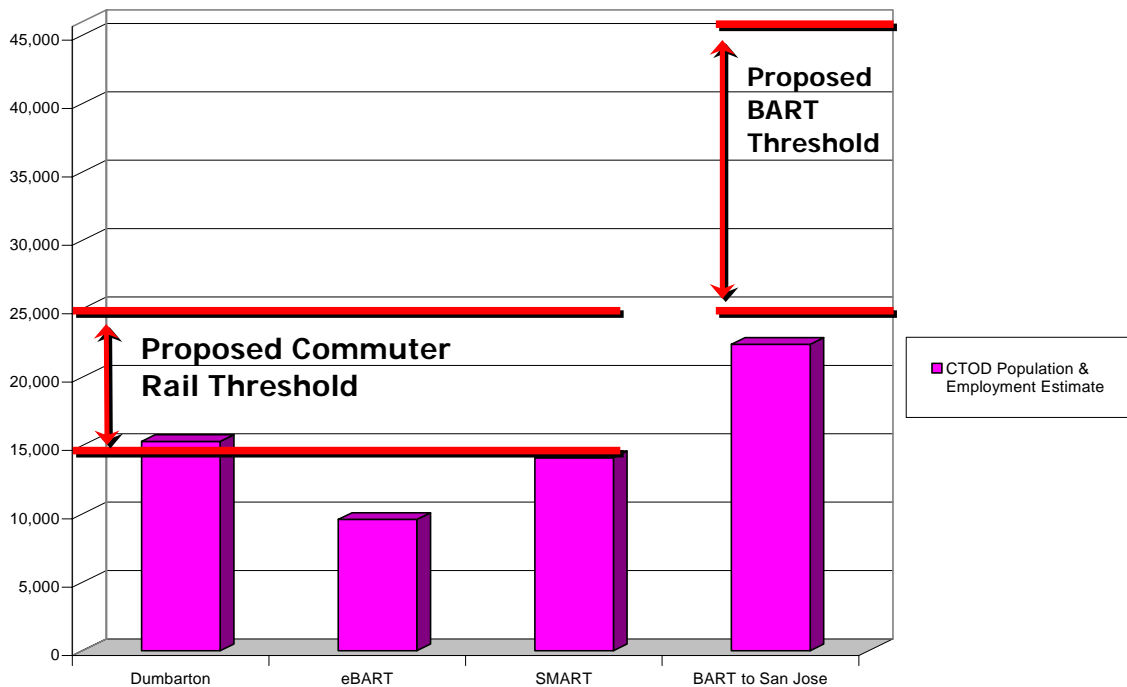


Figure 6: Comparison of the CTOD Estimate to the Proposed MTC Corridor Population and Employment per Square Mile Thresholds.



### Analysis of Case Study Corridor Performance

Analysis of the Census 2000 corridor Transit Planning Area data shows all corridors except the Dumbarton Corridor need future growth to meet the MTC population thresholds. Both ABAG's policy-based Projections 2003 and CTOD's demand-land supply estimate show all case study corridors can exceed the population performance measure. Similarly, the upper end of the estimated General Plan buildout range shows the potential for corridors to achieve the population measures. See Figure 7 below.

*Figure 7: Comparison of the All Corridor Estimates to the Proposed MTC Corridor Population per Square Mile Thresholds.*

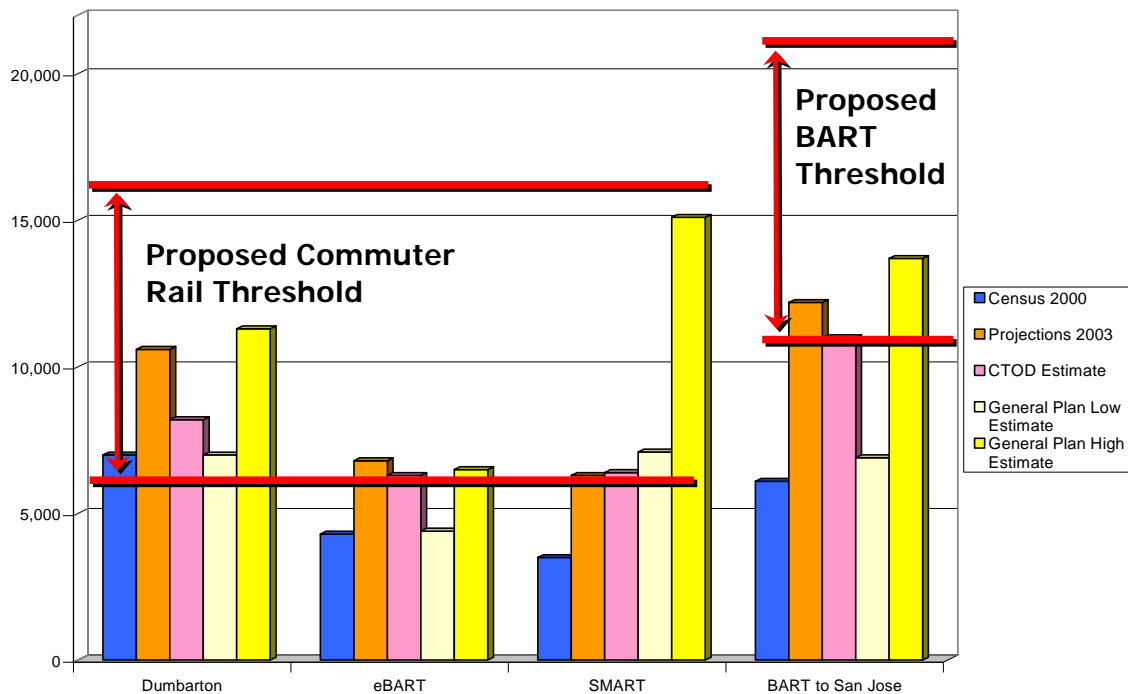
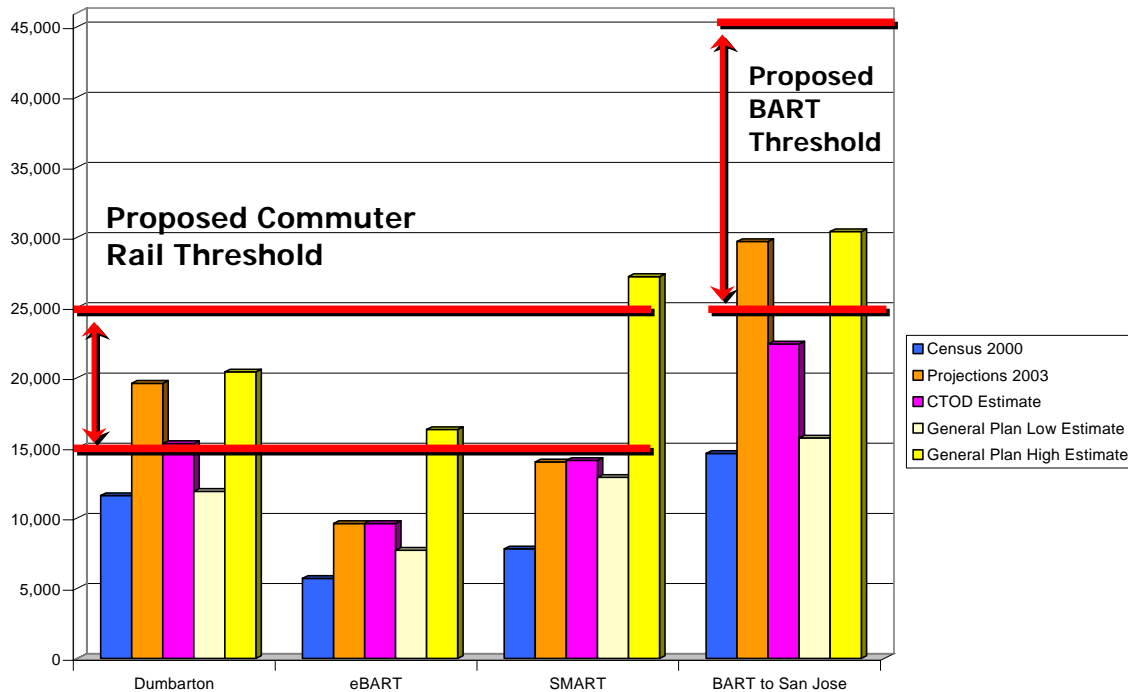


Figure 8 compares the case study corridors to the population and employment measure. In general, corridors will not meet the population and employment measure. With the exception of the Dumbarton Corridor, future development on all commuter rail corridors would need to exceed Projections 2003 and the CTOD estimate to meet the threshold. Projections 2003 shows a scenario where BART to San Jose can exceed the thresholds. If local jurisdictions could build out the upper end of their general plan capacity estimate, then all corridors have the opportunity to achieve the population and employment measure.



Figure 8: Comparison of the All Corridor Estimates to the Proposed MTC Corridor Population and Employment per Square Mile Thresholds.



The following sections discuss each case study corridor more specifically.

#### *Dumbarton Case Study Evaluation*

Located within a major regional commute corridor, the Dumbarton Corridor appears well positioned to achieve the proposed performance measures set by MTC. The corridor already meets the minimum population measure based on Census 2000 figures, and additional development will push the Dumbarton Corridor to the top of the thresholds.

The estimated capacity of local General Plans, at the low end, represents no increase in housing over existing conditions, but the population threshold would continue to be met. For population and employment, the lower end of the General Plan estimates falls short of the proposed threshold by about 20%. The upper end of the General Plan capacity estimates would fall near the midpoint of both of the proposed threshold ranges.

Forecasts for high levels of future development along the Dumbarton Corridor seem highly plausible. Projections 2003 show the corridor would exceed the minimum population threshold by over 75% and would exceed the minimum population and employment threshold by about 30%.

While many jurisdictions believe these policy-based figures to be high, the independent CTOD estimate balancing both the current corridor demand for TOD and land supply shows the corridor would exceed the minimum population threshold by 37% and the minimum population and employment measure by about 2%.

Forecast figures illustrate a general development trend along the Dumbarton Corridor. The Union City BART station plans for development including more than 1,000 new dwelling units and 1.75 million square feet of commercial space. Similarly, Redwood City's Downtown Plan shows the Caltrain station as a major catalyst site within the Downtown Area, accommodating several hundred new dwelling units.

Additionally, plans for the Dumbarton Rail show the corridor's trains continuing into the Caltrain network, giving the corridor high levels of connectivity to major employment centers along the Peninsula and in the South Bay.

It should be noted that the Newark station location was shifted to the west of the studied Transit Planning Area and station location after the analysis was completed. The new location represents less opportunity for TOD due to wetland constraints and remoteness from existing development.

#### *eBART Case Study Evaluation*

Due to its current low population densities, relatively remote location in the region, and challenging market for employment uses and higher density housing, this corridor is in need of a path to success for achieving the proposed thresholds.

Evaluation of the corridor level metrics shows eBART needs to make significant gains at each station to achieve the corridor level performance measures. Existing conditions evaluated using Census 2000 figures show the corridor is about 27% below the minimum population threshold and about 23% below the minimum population and employment threshold.

The estimated capacity of local General Plans, at the low end, represents almost no increase in development over existing conditions and would not come close to meeting either threshold. The upper end of the General Plan capacity estimates would be just sufficient to meet the minimum thresholds for both population and population and employment.

Both Projections 2003 and the CTOD estimate exceed the minimum population threshold (Projections by 13% and CTOD by 5%) but would fall approximately 35% short of the minimum population and employment threshold. In part, this reflects the relatively low projected growth for this sub-county in the industry sectors that historically choose to locate near transit (e.g. office).

Though forecasts show eBART can meet the MTC population performance measure, the eBART corridor must maximize its resources to achieve MTC's goal. The following is an inventory of some of those resources and paths to success.

- Redevelop the 80 acre Antioch fairgrounds site
- Develop a multi-jurisdiction station area plan for the Empire/Neroly station area that includes higher density housing and transit-supportive employment types

- Utilize the maximum densities allowed in the Antioch – Hillcrest station TOD zone
- Capitalize on Brentwood's desire for more, high-density housing
- Evaluate the appropriateness of including the Bryon Station

#### *SMART Case Study Evaluation*

Located within a major commute corridor, the SMART corridor appears to be on track to meet the MTC population performance measure. The corridor parallels the major north-south Highway 101, connecting many existing downtowns and several potential new development sites along the route. Though the demand for employment within the corridor is high, land supply issues will make the population and employment measures more difficult to attain.

Evaluation of the corridor's Census 2000 data shows it is approximately 42% below the minimum population threshold and only accommodates about half of the proposed population and employment threshold.

There appears to be considerable General Plan capacity at several of the stations. The estimated capacity of local General Plans, even at the low end, would appear to meet the population threshold comfortably - even the low end estimate exceeds the minimum threshold by about 18%. The upper end of the General Plan capacity estimates coincide roughly with the high end of the population threshold range. For the population and employment measure, the low end of the General Plan capacity estimates would fall short of the minimum threshold by about 14%, but the high end actually appears to exceed the high end of the threshold range.

Both Projections 2003 and the CTOD estimate for this corridor would exceed the minimum population threshold by about 5% but would fall about 6% short of the minimum population and employment threshold.

The SMART corridor needs approximately 27,000 people and 52,000 jobs to meet the corridor population and employment performance measures. Though demand estimates for the SMART corridor show an increase of approximately 100,000 jobs within the corridor, the corridor might lack the needed land supply to accommodate the demand estimate or meet the MTC performance measure.

Land supply issues aside, the SMART corridor shows a significant downtown development trend. For example, the Central Petaluma Specific Plan developed in 2003 set the way for new mixed-use development adjacent to the proposed SMART station location. New developments include an affordable housing development by Eden Housing, the D Street redevelopment project, the new senior facility the Golden Eagle Center, and acquisition of land for a waterfront park. Stations in Windsor, San Rafael, Cotati, and other cities are also encouraging mixed-used, infill development.

Several other paths to performance success:

- Actively use the SMART TOD/Pedestrian framework in developing parcels adjacent to the transit stop
- Increase auto and non-auto connectivity from the transit stop to the surrounding neighborhoods
- Seek transit-supportive employment at the transit nodes
- Balance the need for park and ride access and TOD in the corridor

It should be noted here that several of the station locations changed during the course of the MTC TOD Policy study. The North Novato, Corona Road, Rohnert Park, and Jennings Avenue stations were excluded in the original ABAG Future Population, Households and Employment Data and Analysis in the Smart Growth TOD Zones and the ABAG Summary of Current Land Uses (Generalized Planned Land Use). Therefore we do not include these stations in the Generalized Planned Land Use and Projections 2003 estimates, but the four stations are included in the Census 2000 and CTOD estimates.

#### *BART to San Jose Case Study Evaluation*

The BART to San Jose corridor will have a difficult time achieving the proposed performance measures. While encouraging signs shows the corridor developing at higher densities, the higher corridor standards for BART would appear to require regulatory changes to meet the thresholds.

Evaluation of Census 2000 data shows existing densities along the BART corridor are similar to the proposed minimum population density threshold for commuter rail but not the proposed BART threshold of 11,000 people per square mile (about 45% below the threshold). Similarly, the population and employment falls 42% short of the proposed performance measure.

For both of the proposed thresholds, the high end of the estimated capacity range of local General Plans would comfortably meet the minimum thresholds. However, the low end of the General Plan estimates would not be sufficient to meet the population threshold and would only barely meet the minimum population and employment threshold.

Projections 2003 figures anticipate an increase in employment and a near doubling of population in this corridor, which would be just sufficient to meet the proposed BART thresholds for both population and population and employment. The Center for TOD estimate, which accommodates about 39,000 new people and 23,000 jobs, achieves the population measure but not the population and employment measure.

Several encouraging facts indicate potential for the BART to San Jose corridor to achieve these performance thresholds. Residential densities at several projects in San Jose and Milpitas already reflect the overall densities the corridor needs to achieve success.

Additional paths include:

- Encourage good station area and specific plans similar to those in Santa Clara, Diridon, and Milpitas

- Redevelop the Berryessa/Flea Market site
- Consider the appropriate employment type at each station
- Evaluate station shuttles to major regional employers (e.g. NUMMI)

The BART to San Jose scenario evaluated in this analysis includes nine stations and excludes optional stations at Irvington and South Calaveras.

### Analysis of Case Study Station Performance

Though the proposed MTC Transit-Oriented Development Policy performance measure applies at the corridor-level and not at individual stations, case study stations were used to explore the potential for TOD in greater detail. Transit Planning Area Census, Projections, and ABAG data were analyzed for each of the stations, and then compared to proposed MTC performance measures. Local jurisdictions and transit agencies provided additional input by describing current and future development opportunities in and around the station area.

Analysis of the Census 2000 data shows only the Union City station currently meets the proposed MTC population performance measure. Data indicates the Petaluma SMART station can achieve the proposed measure for population under both Projections 2003 and the CTOD estimate if future development occurs in the station area. Transit Planning Area data for the Richmond Ferry shows the station needs to make significant gains to achieve the threshold.

*Figure 9: Comparison of the All Case Study Estimates to the Proposed MTC Corridor Population per Square Mile Thresholds.*

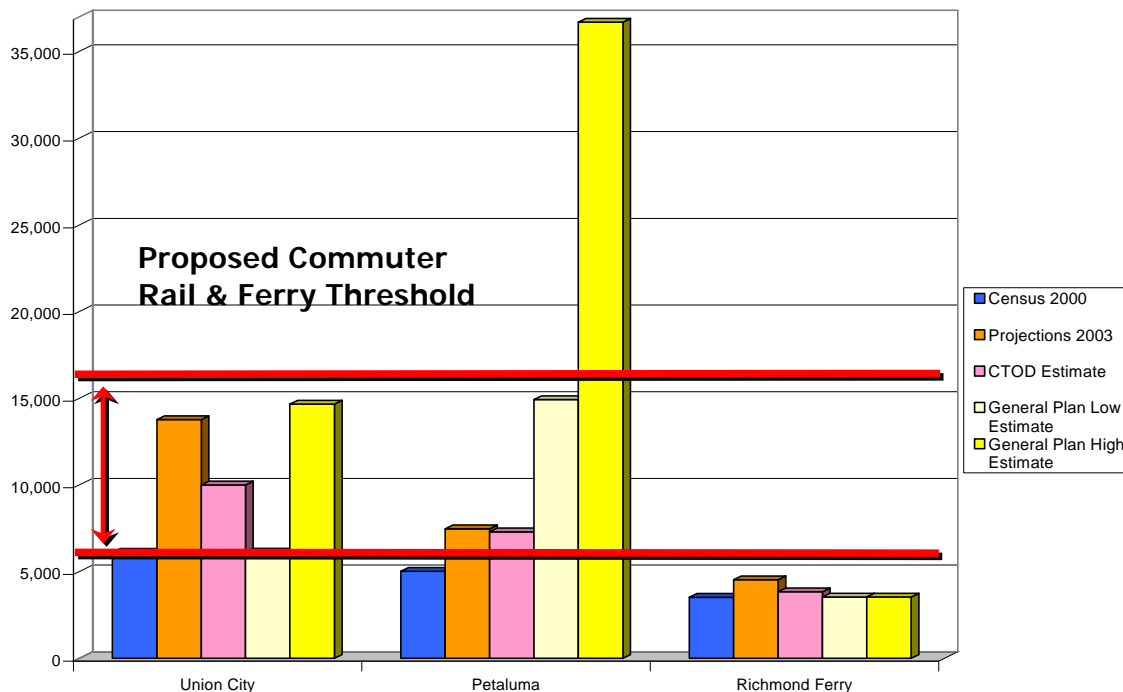
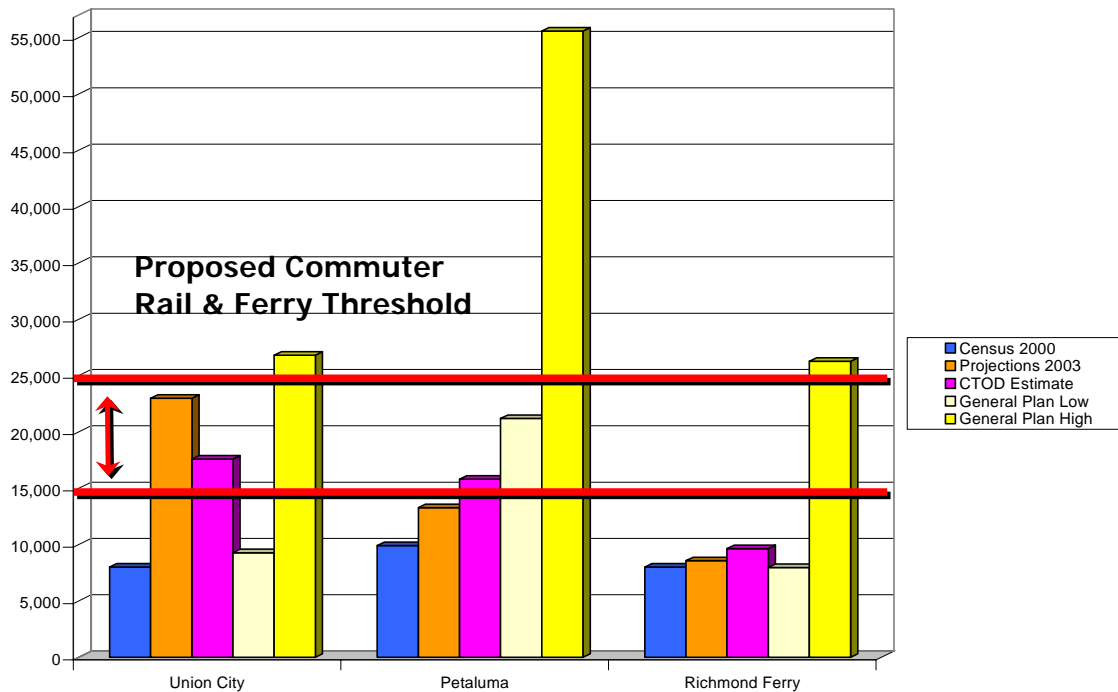


Figure 10 compares the case study stations to the population and employment measure. Both Projections and CTOD estimates show Union City and Petaluma station can achieve the threshold if the stations receive significant new development. Additionally, if local jurisdictions could build out the upper end of their general plan capacity estimate, then all stations have the opportunity to achieve the population and employment measure.

*Figure 10: Comparison of the All Case Study Estimates to the Proposed MTC Corridor Population and Employment per Square Mile Thresholds.*



The following sections discuss each case study station more specifically.

#### *Union City Case Study Evaluation*

Sited at the potential confluence of BART, Dumbarton, ACE, Capitol Corridor, and high speed rail service, the Union City is well positioned to develop into a regional transportation hub. Future plans show the rerouting of ACE and Capitol Corridor service through the existing BART station and the expansion and development of a larger, intermodal facility.

Additionally, several hundred acres of land is currently available through environmental remediation and redevelopment of underutilized parcels within a half-mile of the transit stop. Current Plans show these parcels developing at transit supportive densities with plans calling for more than 1,200 units and 2 million square feet of commercial space.

Analysis of the Union City Transit Planning Area data illustrates the station is well positioned to achieve the proposed corridor-level performance measures set by MTC. The station already meets the minimum population measure based on Census 2000 figures,

and additional development will push the entire Dumbarton Corridor to the top of the corridor-level measure.

The estimated capacity of local General Plans, at the low end, represents no increase in housing over existing conditions, but the population threshold would be met. For population and employment, the lower end of the General Plan estimates falls short of the proposed threshold by about 40%. The upper end of the General Plan capacity estimates approach or exceed the high threshold.

Projections 2003 show the station would exceed the minimum population threshold by approximately 130% and would exceed the minimum population and employment threshold by over 50%. A more conservative CTOD estimate demonstrates that balancing both the population and employment demand for TOD and land supply will allow the station to exceed the minimum population threshold by 65% and the minimum population and employment measure by about 17%.

Current and future development trends for the Union City station confirm the Projections and CTOD estimates. If the future development plans are added to the existing Census Transit Planning Area data, Union City would exceed the population measure by over 40% and would fall just short of the population and employment measure.

#### *Petaluma Case Study Evaluation*

The Petaluma SMART station is located on the edge of the existing Downtown Petaluma business district. Partially covered under the Central Petaluma Specific Plan, the Petaluma station area is currently undergoing significant redevelopment. New developments include an affordable housing development by Eden Housing, the D Street redevelopment project, a new senior facility, the Golden Eagle Center, and acquisition of land for a waterfront park.

Analyzing existing conditions at the Petaluma station demonstrates the station nearly meets the proposed MTC population measure but falls well short of the population and employment measure.

The estimated General Plan buildout capacity shows Petaluma has significant capacity to develop. The estimated capacity at the low end would appear to meet both population and employment measures. At the low end, the capacity estimates exceed the thresholds by nearly 150%.

Additionally, future development forecasts show that Petaluma can achieve the population and employment performance measures. Both the Projections 2003 estimate and the CTOD estimate exceed the proposed population threshold by approximately 20-25% while only the CTOD estimate illustrates Petaluma can meet the population and employment measure.

### *Richmond Ferry Terminal Case Study Evaluation*

Evaluation of the Richmond ferry terminal shows the station will not achieve the proposed MTC Ferry thresholds. Existing Census 2000 data for the Transit Planning Area shows Richmond is approximately 41% below the proposed population measure of 6,000 people per square mile and 59% below the 15,000 people and jobs per square mile threshold.

The estimated capacity of local General Plans, at the low and high ends, represents no increase in development over existing conditions for the population evaluation and would not achieve the performance measure. While the high end of the population and employment evaluation exceeds the proposed threshold, the midpoint falls well below the threshold.

Projections 2003 shows the ferry terminal area still falls short of the both the population (24%) and population and employment measures (43%).

Current and future development projects compiled by URS show the high potential for development in and around the half-mile radius from the ferry terminal. Proposed projects within the half-mile radius include the Ford Building, West Shore Marinas, and the old F&P Cannery site. Proposals for those sites would add approximately 300 residential units and 671,000 square feet of commercial space.

The URS Waterfront study also includes several other current development projects in the Transit Planning Area. These proposals beyond the half-mile radius but inside the Transit Planning Area would potentially total 1,600 additional residential units and 2.5 million square feet of commercial space.

Several other paths to performance success:

- Grade-separating Marina Way South from the existing freight rail tracks
- Relocating some port land to facilitate development around the ferry terminal



## **Recommendations**

From the evaluation of the proposed MTC Transit-Oriented Development Policy thresholds, we recommend the following set of changes and additions to the MTC TOD Policy study.

First, **translate corridor level population performance measures to dwelling unit thresholds**. Since cities typically evaluate units, translating population thresholds to a unit-based threshold will allow easier description and discussion of the MTC Policy. Additionally, deriving population figures from dwelling units requires an important assumption regarding household size and could cause under or over counting.

Second, **evaluate dwelling units and employment within a half-mile of a transit station**. Though the initial data gathering by MTC and ABAG used the Transit Planning Area geography, the proposed MTC Transit-Oriented Development Policy and subsequent station area planning focus on the area within a half-mile of a transit stop. We converted our threshold evaluations to per station figures allowing us to estimate development potential within the half-mile radius. Additional local data gathered by MTC will be an important future comparison.

Third, **revise the commuter rail and BART dwelling unit and employment per station measures to 5,000 to 12,000 and 13,000 to 25,500 respectively**. Evaluation of the proposed threshold shows corridor and stations located within certain portions of the region will be challenged to attract the necessary employment types and formats to meet the original figure.

Forth, **apply a 50% bonus to affordable housing units sold or rented below current market rates** (80% of Area Median Income). The affordability bonus creates a nexus between the most transit dependent and the regional infrastructure investment and attracts an initial base of transit riders.

Fifth, **consider an additional regional employment access measure that evaluates regional connections to primary, secondary, and tertiary centers** defined by Strategic Economics and the Center for Transit-Oriented Development. Corridor evaluations and roundtable discussions illustrated the need to address connections to these job centers.

Sixth, **use a 300 dwelling unit and 1,500 job *minimum* performance measure within a half-mile of a ferry terminal**. Case study evaluation of the Richmond ferry terminal shows individual terminals need to be evaluated using a lower set of figures derived from current and potential development projects at the Richmond terminal.

### *Recommendation Methodology*

The following describes the methodology used to translate current MTC population and employment thresholds to dwelling unit and employment measures. Then we evaluated the case study corridors based on the new thresholds and our estimate of existing and potential development within a half-mile radius of the station.

Using a straight-line conversion, we calculated dwelling units per square mile by dividing the MTC Low and High thresholds by the average regional TOD household size (2.5). A per station figure was derived by taking the dwelling units per square mile figure and multiplying it by 0.79 square miles, the size of a half-mile circle. Figures were rounded to the appropriate significant figure. The following table compares the population threshold in the proposed MTC TOD Policy to the dwelling unit per station figure.

<b>Resolution 3434 Expansion Corridor Transit Mode</b>	<b>Population per Square Mile - MTC Low Threshold</b>	<b>Population per Square Mile - MTC High Threshold</b>	<b>Dwelling Units per Station Needed to Meet the MTC LOW Threshold</b>	<b>Dwelling Units per Station Needed to Meet the MTC HIGH Threshold</b>
Commuter Rail	6,000	16,000	2,000	5,000
BART	11,000	21,000	3,500	6,500

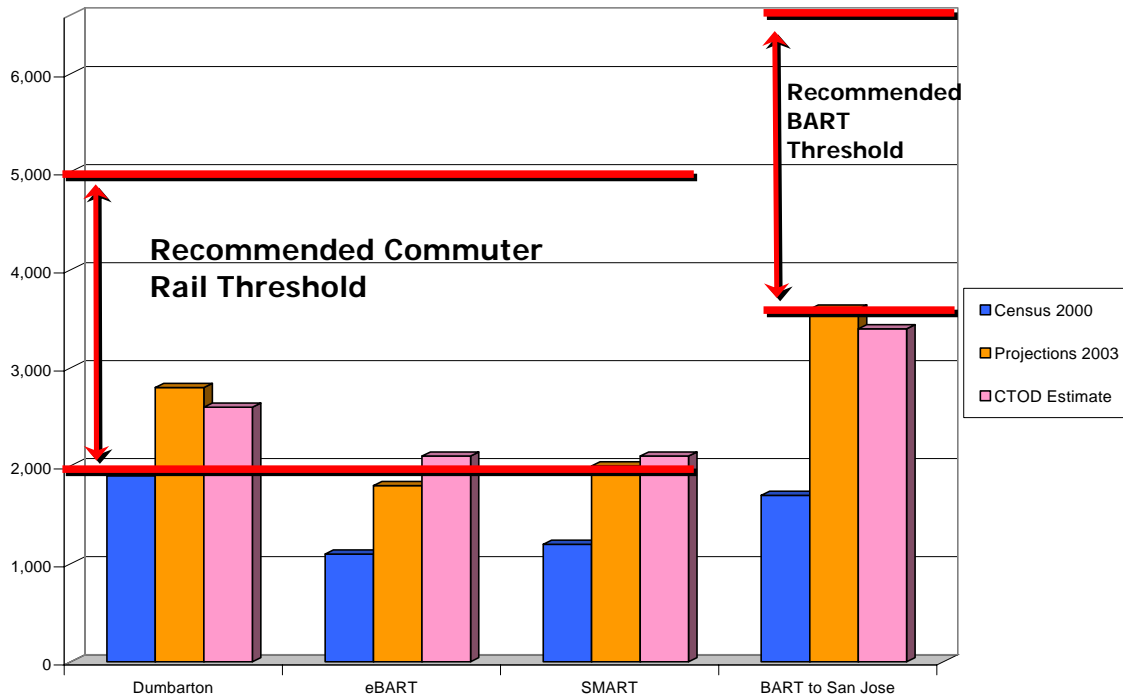
The per station figure does not immediately relate to our previous Transit Planning Area data analysis. The area of the Transit Planning Areas varies widely from station to station and does not always relate to the size of a half-mile circle. Approximately 60% of the stations are at least 10% larger than the area of a half-mile circle, and 25% are at least 10% smaller. The following table illustrates the difference between each corridor's total Transit Planning Area land area and the area of the half-mile radius around each station.

<b>Resolution 3434 Expansion Corridor Transit Mode</b>	<b>Total Transit Planning Area (Square Miles)</b>	<b>Total Half Mile Station Area (Square Miles)</b>	<b>Difference Between Total Transit Planning Area and Total Station Area Geography</b>	<b>Percent Transit Planning Area is Greater than Station Area Geography</b>
Dumbarton	6.65	3.95	2.70	67%
EBART	8.45	5.53	2.92	53%
SMART	11.11	11.06	0.05	0%
BART to San Jose	7.90	7.11	0.79	11%

In order to evaluate the corridor's performance to the proposed per station measures, we adjusted the Transit Planning Areas estimates for Census 2000, Projections 2003, and CTOD to half-mile circle. We proportionally adjusted dwelling unit and employment from the TPA original land area to a half-mile area using the following formula.

$$\text{Dwelling Units within a Half-Mile of a Station} = \text{Total TPA Dwelling Units} \times (0.79 / \text{Total TPA Land Area})$$

Figure 11: Comparison of the All Corridor Estimates to the Recommended Corridor Dwelling Unit per Station Threshold.



Analysis of the Census 2000 station area data in Figure 9 shows all corridors except the Dumbarton Corridor need future growth to meet the MTC dwelling unit thresholds. Both ABAG's Projections 2003 and CTOD's estimate show each case study corridor can achieve the proposed MTC thresholds.

Next, we evaluated the corridor's potential to achieve a dwelling unit and employment threshold by translating the proposed MTC TOD Policy population and employment per square mile thresholds to dwelling units and employment per station. We subtracted the Low Population & Employment per Square Mile Threshold from the Low Population per Square Mile Threshold. The resulting Low Employment per Square Mile is multiplied by 0.79 squares and then added to the Dwelling Unit per Station threshold. Figures were rounded to the appropriate significant figure.

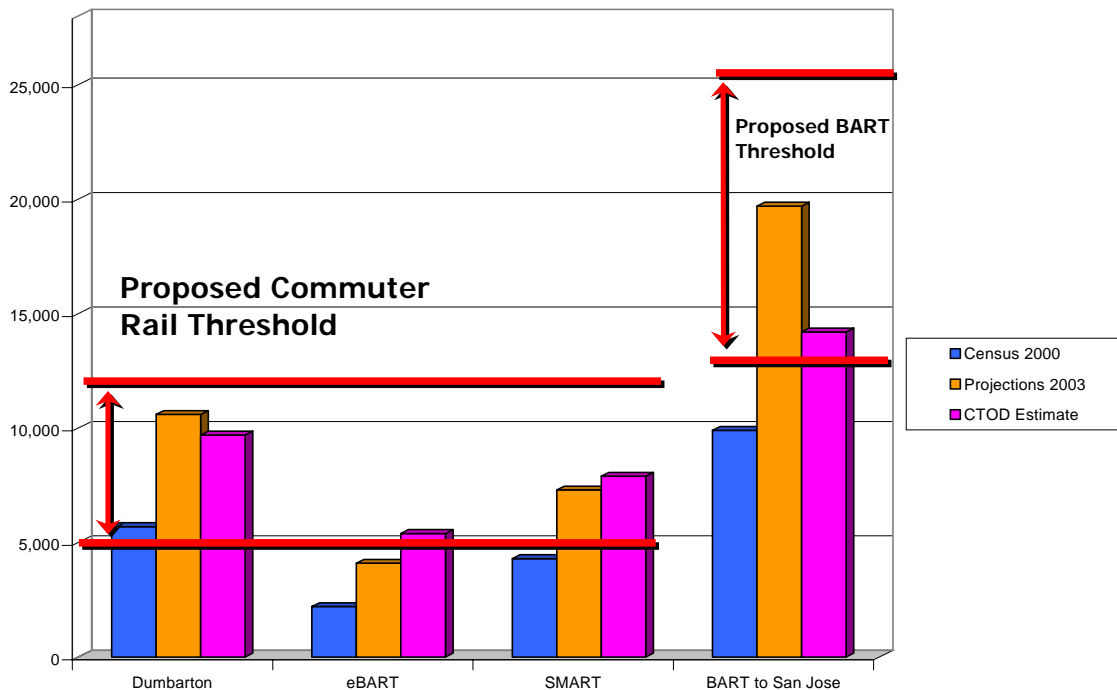
Resolution 3434 Expansion Corridor Transit Mode	Population and Employment per Square Mile - MTC Low Threshold	Population and Employment per Square Mile - MTC High Threshold	Dwelling Units and Employment per Station Needed to Meet the MTC LOW Threshold	Dwelling Units and Employment per Station Needed to Meet the MTC HIGH Threshold
Commuter Rail	15,000	25,000	9,000	12,000
BART	25,000	45,000	14,500	25,500

Comparison of the combined dwelling unit and employment measure mirrors the performance results shown in Figure 8. Neither eBART nor SMART meets the commuter rail thresholds under Projections 2003 or the CTOD estimates. Though BART to San Jose achieves the threshold under Projections 2003, the corridor will not meet the measure under the CTOD estimate.

It is our recommendation that the employment threshold for commuter rail be lowered to 3,000 jobs per station at the low end while maintaining the 7,000 jobs figure at the high end. Additionally, we recommend lowering the employment threshold for BART to 9,500 jobs per station at the low end. These per station employment figures could be evaluated separately or the employment figures could be combined with the dwelling unit per station measure. The results of the combined dwelling unit and employment measure are shown in the following table and figure.

<b>Resolution 3434 Expansion Corridor Transit Mode</b>	<b>Population and Employment per Square Mile - MTC Low Threshold</b>	<b>Population and Employment per Square Mile - MTC High Threshold</b>	<b>Dwelling Units and Employment per Station Needed to Meet the MTC LOW Threshold</b>	<b>Dwelling Units and Employment per Station Needed to Meet the MTC HIGH Threshold</b>
Commuter Rail BART	15,000 25,000	25,000 45,000	5,000 13,000	12,000 25,500

*Figure 12: Comparison of the All Corridor Estimates to the Recommended Corridor Dwelling Unit and Employment per Station Threshold.*



Evaluation of the revised thresholds shows both SMART and BART to San Jose would meet this threshold, but achieving the proposed threshold will still be challenging for the eBART corridor.

#### *Affordable Housing*

It is our recommendation that MTC consider an affordability bonus applied towards the performance measures. A generally accepted definition of affordable housing is housing that consumes no more than 30 percent of household income. Rental or owner occupied units that qualify for this subsidy could be given a dwelling unit bonus of 50%.

By encouraging affordable housing at transit stations, MTC provides the most transit-dependent population with direct access to the infrastructure investment. Research shows approximately 27 percent of transit riders have annual incomes under \$15,000 and 53 percent have incomes between \$15,000 and \$50,000. Additionally, providing affording housing near the station creates an initial market for corridor ridership.

#### *Regional Employment Center Access*

MTC should consider regional employment center access in the evaluation of expansion corridors. Since businesses tend to locate near other businesses, the current location of employment centers will help dictate future employment growth. Access to these centers provides an excellent opportunity for the corridor to expand future ridership.

Analysis of current Bay Area employment centers by Strategic Economics and CTOD shows 2 primary job centers in San Francisco and Silicon Valley, 5 secondary centers, and 24 tertiary centers. The Dumbarton and BART to San Jose corridors directly access both primary and secondary job centers along the Peninsula and Southbay, while the SMART corridor connects to San Francisco with a ferry transfer at its terminus. The eBART corridor is more remote, but it does provide connectivity to several tertiary centers and a lengthy link to San Francisco.

MTC could approximate regional employment center access by measuring the distance and approximate travel time between each station and existing regional employment centers.

#### *Ferry Threshold Recommendations*

Evaluation of the Richmond ferry terminals illustrated the need to consider alternative performance evaluations for ferry stations. We recommend a total dwelling unit *minimum* of 300 units and a total employment minimum of 1,500 jobs for each ferry terminal.

Ferries are designed to minimize a passenger's commute time. Typically, ferry stops are oriented at the harbor's edge to avoid costly time penalties due to wake restrictions near existing development. Not only does this create distant pedestrian connections, but it minimizes the amount of land available for transit-oriented development.

Unlike rail stations included in the case study evaluations, ferries have significantly less developable land within a half-mile of the terminal. Nearly 75% of the half-mile circle is inaccessible from the proposed ferry stop in Richmond. A visual survey of the Larkspur and Redwood City ferry terminals suggests other ferry terminals will contend with this same issue.

Though the total land supply is smaller than rail stations, current and future development projects at the Richmond ferry terminal show that potential for transit-oriented development in and around the one-half mile from the ferry terminal exists. On the roughly 100 - 125 acres within the half-mile radius approximately 300 new residential units and 1,300 - 1,800 new jobs are expected according to study completed by URS.

### **Additional Analysis Notes**

Several data notes should be listed.

In several instances, the square mile areas of several Transit Planning Areas were adjusted to equate to the true half mile circle.

- Empire/Neroly station – eBART
- Warm Springs station – BART to San Jose
- Alum Rock station – BART to San Jose
- North Novato – SMART

Population, household, and employment figures for Alum Rock and North Novato were proportionally adjusted to the area calculations. Using Alum Rock as an example, 52% of the Transit Planning Area was inside the half mile circle. Therefore, we multiplied the TPA population, household, and employment figures by 52% to estimate those figures within the half mile circle.

The Empire/Neroly station area has no existing population, households, and employment. Future figures were adjusted proportionally as at the Alum Rock and North Novato stations.

The existing population, households, and employment were assessed differently at the Warm Springs station area, which includes existing employment but little or no housing. Using current aerial photography, we calculated the total employment area within the half-mile circle. We multiplied the total employment area by our regional FAR assumptions, rules of thumb for employees per square foot of commercial, and mixture to employment types to derive an employment figure for 2000. The 2000 population and households were assumed at zero. Future figures were adjusted proportionally as at the Alum Rock and North Novato stations.

**Task 6c - MTC Resolution 3434 Case Study Corridor Evaluation - BART to San Jose  
Corridor Station Area Analysis**

Station Name	Census '00 Total Station Area Households	Projections '03 Total Station Area Households	CTOD Estimated Station Area Dwelling Unit Buildout	Recommended Dwelling Units Per Station Threshold	
Alum Rock	2,200	4,400	3,300	Low	High
Berryessa	1,700	2,900	4,600		
Civic Plaza/SJSU Station	3,800	7,300	4,300		
Diridon/Arena	1,300	4,400	4,000		
Fremont BART Station	3,100	4,500	4,100		
Market Street	2,300	5,200	3,800		
Montague / Capital	100	1,700	2,400		
Santa Clara	700	2,100	2,000		
Warm Springs	-	200	2,200		
<b>BART Corridor Per Station Average</b>	<b>1,700</b>	<b>3,600</b>	<b>3,400</b>	<b>3,500</b>	<b>6,500</b>

Station Name	Census '00 Total Station Area Employment	Projections '03 Total Station Area Employment	CTOD Estimated Station Area Employment Buildout	Recommended Employment Per Station Threshold	
Alum Rock	2,900	5,600	2,900	Low	High
Berryessa	1,300	5,100	3,800		
Civic Plaza/SJSU Station	9,600	22,500	10,500		
Diridon/Arena	5,600	19,300	16,100		
Fremont BART Station	4,500	8,100	5,600		
Market Street	32,700	43,900	35,700		
Montague / Capital	8,300	14,900	9,900		
Santa Clara	7,200	16,100	10,900		
Warm Springs	2,000	9,400	2,000		
<b>BART Corridor Per Station Average</b>	<b>8,200</b>	<b>16,100</b>	<b>10,800</b>	<b>9,500</b>	<b>19,000</b>

Station Name	Census '00 Total Station Area Households & Employment	Projections '03 Total Station Area Households & Employment	CTOD Estimated Station Area Dwelling Unit & Employment Buildout	Recommended Dwelling Units & Employment Per Station Threshold	
Alum Rock	5,100	10,000	6,200	Low	High
Berryessa	3,000	8,000	8,400		
Civic Plaza/SJSU Station	13,400	29,800	14,800		
Diridon/Arena	6,900	23,700	20,100		
Fremont BART Station	7,600	12,600	9,700		
Market Street	35,000	49,100	39,500		
Montague / Capital	8,400	16,600	12,300		
Santa Clara	7,900	18,200	12,900		
Warm Springs	2,000	9,600	4,200		
<b>BART Corridor Per Station Average</b>	<b>9,900</b>	<b>19,700</b>	<b>14,200</b>	<b>13,000</b>	<b>25,500</b>

## Task 6c - MTC Resolution 3434 Case Study Corridor Evaluation - Station Area Analysis

<b>Resolution 3434 Case Study Corridor</b>	<b>Census '00 Total Station Area Households</b>	<b>Projections '03 Total Station Area Households</b>	<b>CTOD Estimated Station Area Dwelling Unit Buildout</b>	<b>Recommended Dwelling Units Per Station Threshold</b>		<b>Census '00 Total Station Area Households</b>	<b>Projections '03 Total Station Area Households</b>	<b>CTOD Estimated Station Area Dwelling Unit Buildout</b>
Dumbarton	9,500	14,100	12,800	<i>Low</i>	<i>High</i>	1,900	2,800	2,600
eBART	7,700	12,500	14,300	2,000	5,000	1,100	1,800	2,000
SMART*	17,100	20,000	29,800			1,200	2,000	2,100
BART to San Jose**	15,300	32,700	30,800	3,500	6,500	1,700	3,600	3,400

<b>Resolution 3434 Case Study Corridor</b>	<b>Census '00 Total Station Area Employment</b>	<b>Projections '03 Total Station Area Employment</b>	<b>CTOD Estimated Station Area Employment Buildout</b>	<b>Recommended Employment Per Station Threshold</b>		<b>Census '00 Total Station Area Employment</b>	<b>Projections '03 Total Station Area Employment</b>	<b>CTOD Estimated Station Area Employment Buildout</b>
Dumbarton	19,200	39,100	35,500	<i>Low</i>	<i>High</i>	3,800	7,800	7,100
eBART	7,600	15,900	23,600	3,000	7,000	1,100	2,300	3,400
SMART*	42,800	52,900	81,200			3,100	5,300	5,800
BART to San Jose**	74,000	144,800	97,200	9,500	19,000	8,200	16,100	10,800

<b>Resolution 3434 Case Study Corridor</b>	<b>Census '00 Total Station Area Households &amp; Employment</b>	<b>Projections '03 Total Station Area Households &amp; Employment</b>	<b>CTOD Estimated Station Area Dwelling Unit &amp; Employment Buildout</b>	<b>Recommended Dwelling Units &amp; Employment Per Station Threshold</b>		<b>Census '00 Total Station Area Households &amp; Employment</b>	<b>Projections '03 Total Station Area Households &amp; Employment</b>	<b>CTOD Estimated Station Area Dwelling Unit &amp; Employment Buildout</b>
Dumbarton	28,700	53,200	48,300	<i>Low</i>	<i>High</i>	5,700	10,600	9,700
eBART	15,300	28,400	37,900	5,000	12,000	2,200	4,100	5,400
SMART*	59,900	72,900	111,000			4,300	7,300	7,900
BART to San Jose**	89,300	177,500	128,000	13,000	25,500	9,900	19,700	14,200

\*4 stations do NOT have Projections 2003 data and were excluded from the Projections 2003 analysis.

\*\*BART to San Jose Corridor does not include optional stations at Irvington or South Calaveras.